

HEEP: HARDWAR-249 403 (UK)

Fax: 01334-226462, Phone: 01334-284144

E-mail: ajayk@bhelhwr.co.in

Tender no: PPX-F&HE/EOI/SL/16-17/02

Notice for Expression of Interest for empanelment of New Vendors

The Heavy Electrical Equipment Plant (HEEP) located in Haridwar, is one of the major manufacturing plants of BHEL. The core business of HEEP includes design and manufacture of large steam and gas turbines, turbo generators, condenser and generators and so on.

We are looking for reputed vendors having capability to supply Turbine Blade Flats Grade X20Cr13 (HW10786 Rev: 06), X22CrMoV121 (HW10687 Rev: 06), X19CrMoNbVN11-1 (HW10670 Rev: 06) & X12CrMoWVNbN10-1-1 (HW10663 Rev: 05)

Approx. annual requirement is 71 MT, 163 MT, 675 MT, 410 MT for Material Grade X12, X19,

X20 & X22 respectively.

Contact persons:

Mr. Yashpal Yadav

Designation: Engr (PPX-F & HE) Email: yash-pal@bhelhwr.co.in Phone No: +91 1334-284144 Mobile: +91 9012227802 Mr. Ran Singh Chauhan

Designation: Sr. Mgr (PPX-F & HE) Email: rschn@bhelhwr.co.in Phone No: +91 1334-281478

Mobile: +91 9410395890

Mr. Ajay Kr Gupta

Designation: SDGM (PPX & AIX-F) Email: ajayk@bhelhwr.co.in Phone No: +91 1334-284570 Mobile: +91 9410395962

Due Date: 10/10/2016

The offers received will be technically evaluated by BHEL & successful short listed parties will be asked to submit their detailed Techno-Commercial offers through formal NIT/Enquiry for our future requirements. Vendors shall confirm that there is no deviation with respect to BHEL Specifications. However deviations, if any are to be listed as a separate attachment. The offers that do not meet the substantial requirements of our specifications are liable to be ignored.

Following documents are to be necessarily filled and submitted along with the technical offer:

- 1. Details/ Documents in support of Specification/PQR (Annexure-I up-loaded)
- 2. Quality Requirements (Annexure-III) & Quality Plan format (Annexure-III).
- **3.** Supplier/Vendor Registration Form- Go through online supplier registration portal https://supplier.bhel.in/. After filling the online registration form send the copy of same along with your offer within due date.
- 4. Details of Manufacturing Facility
- **5.** Company Profile.
- **6.** Financial report of the company.
- 7. Past experience along with documentary proof.



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Only Technical BID along with the documents mentioned above should be sent and the envelope containing the offer shall be duly sealed and super scribed as "Technical Offer for (ITEM NAME) AGAINST Tender No. PPX-F&HE/EOI/SL/16-17/02

Due Date-10.10.2016, SUBMITTED BY (Name of company)"

- This notification shall be published on <u>www.bhel.com</u>, <u>www.tenders.gov.in</u> and www.bhelhwr.co.in
- Last date for downloading tender documents shall be 09.10.2016 till 1700 Hrs.(IST). Tenders will be received up to 13:45 Hrs. (IST) on 10.10.2016 will be considered and opened on the same day at 14:00 Hrs. (IST) in the Tender Room BHEL HEEP, Haridwar.
- Technical Offers complete in all respect must be addressed to "Shri Ajay Kr Gupta, SDGM (PPX & AIX- F)".
- EMD & Tender fee are not applicable.
- The Quotation should be from the Principal / Original Manufacturer, failing which the quotation may likely to be ignored. In Case the quotation is submitted through agent, the quotation must accompany original authorization letter.
- Late offers will not be considered in any case. BHEL will not be responsible for any type of postal delay / incomplete information from vendor.
- Amendments / Corrigendum, if any, will be hosted on our web site only.

For any further details please log on to www.bhel.com or www.bhel.com or www.bhel.com or www.tenders.gov.in or www.bhel.com or www.tenders.gov.in or www.bhel.com or <a h

(Ajay Kr Gupta)
SDGM (PPX & AIX-F)



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ANNEXURE-I

Expression of Interest for rectangular flat bars for turbine of material grade X20Cr13 (HW10786, Rev06), X22CrMoV121 (HW10687, Rev06) X19CrMoNbVN11-1 (HW10670, Rev06) & X12CrMoWVNbN10-1-1 (HW10663, Rev 05)

- 1. Rectangular flat bars of above mentioned material grade are used for manufacturing of milled blades for Steam Turbines of rating 250 to 800 MW.
- 2. Vendor to submit their manufacturing experience of flats in material grade X20Cr13/X22CrMoV121/X19CrMoNbVN11-1/X12CrMoWVNbN10-1-1 in rectangular cross sectional sizes (width X thickness e.g. 58mmx32mm, 96x46mm etc.) with length 3000 6000 mm. Following details of past supplies to be submitted in support of experience:
 - Un-priced purchase order,
 - Name of customer, quantity supplied
 - Year of supply,
 - Cross Section (width X thickness X length) & Weight.
- 3. Test certificate of past supplies for above material grades, witnessed by third party (like TUV/Lloyd/BVQI etc.), shall be furnished for review.
- 4. Vendor to furnish in house manufacturing facility for steel melting, secondary refining including Electro Slag re-melting (if available), rolling / forging, heat treatment and straightening to manufacturer rectangular bars.
- 5. Vendor to furnish in house testing facilities to carry out testing as per the requirements of BHEL specification. In case of outsourcing any test, vendor to agree to carry out testing at Government accredited labs only.
- 6. Prerequisite requirement for approval of a new vendor is successful process qualification as per clause 9.0 of specification of respective material grade. Process qualification is mandatory for supplier's each manufacturing plants. Vendor to submit results of process qualification as per Clause 9.0 of respective specification, if available.

Note: All documents submitted must be in English language.



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ANNEXURE-II

Quality Requirements-

- ➤ Vendor to furnish manufacturing plan and quality plan along with offer for BHEL review and approval. Quality plan to be submitted in the enclosed format only and to be in line with BHEL specification. Refer annexure-III for quality plan format.
- > Inspection shall be by TPI (LRS/TUV/BV) for import and BHEL nominated agency 'TUV' for indigenous as per finally BHEL approved Quality Plan.



BHARAT HEAVY ELECTRICALS LIMITED HEEP: HARDWAR-249 403 (UK)

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ANNEXURE-III

(Quality Plan Format)

MANUF	ACTURER'S NAME AND	ADDRESS			QUALITY PLAN	1		TO BE FILLED BY BHE	L	TO BE FI	LLED I	BY BHEL
BHEL	VENDOR'S NAME	DRG. NO. SPEC.	AS PE		QP NO. REV							
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	ALL 'W' INDICATED IN COLUMN 'N' SHALL BE 'CHP' OF CUSTOMER		



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ANNEXURE-IV

SPECIFICATION

HW 10786 संस्थान क्रय विनिर्देश (हीप - हरिद्वार) SIGN & DATE पृष्ठ D) हस्ताक्षर Page PLANT PURCHASE SPECIFICATION 1 **of** (HEEP - HARIDWAR) SUPERSEDES INVENTORY NO. 13% Cr Stainless Steel Bars for Turbine Blades GRADE: X20Cr13+QT800 Dec, TLV 9238/01. 1.0 General: 乍 संख्या This specification governs the quality of Steel rectangular bars in steel grade X20Cr13, material no. सूची 1.4021, EN10088-3. 2.0 Application: For machining of blades for Steam Turbine. remation on these documents is the property of Bharat Heavy Electrical Limited not be used directly or indirectly in any way detrimental to the interest. Of the company 3.0 Condition of Delivery: Rolled or Forged and Heat Treated. 4.0 Dimension and Tolerances: COPYRIGHT AND CONFIDENTIAL The dimensions shall be as per purchase order. Unless otherwise stated in the purchase order, length of bars shall be 3 - 6 meters with maximum 10% short down to 1 meter. Tolerance and straightness of bars shall be as follows: B, width across flats Max allowable deviation S, thickness Max allowable deviation must on S, mm (mm) on B, mm (mm) The B ≤ 35 +1.5S ≤ 20 +1 एवं अप्रत्यक्ष 35< B ≤ 75 + 2 20< S ≤ 40 + 2 + 3 B > 755 > 40+3 सम्पत्ति है इसका प्रत्यक्ष हातिकारक हो ना किया Twisting and bending of the bars shall not exceed 0.001X Length of bar limited to maximum 2mm in एवं गोपनीय any one meter length of the bar. Bulging on the sides shall not be more than 0.01 X B and 0.02 X S respectively. ी इतेम्ट्रीकत्स की सम कम्पनी के हित में ह 5.0 Manufacture: Degassed steel (e.g. vacuum degassed) shall be used. Cast ingot is to be used as initial material for 复姓 production of the bars. The manufacturing process must ensure a homogenous grain structure over the entire length of the स्यमा bar and the bar cross section. 智智 6.0 General Requirements: Prerequisite requirement for approval of a new vendor is a successful Process qualification. Manufacturing process established during this shall be the basis for future manufacture.

अनुवादक

स्वीकृति

APPROVED

दिनॉक एवं हस्ताक्षर

TRANSLATED BY

निर्माणकर्ता WORKED BY

जांचकर्ता CHECKED BY

PREPARED: MTE

पर्यवेक्षणकर्ता SUPERVISED BY

& DATE

हस्ताक्षर एवं दिनॉक

सामग्री सूची संख्या INVENTORY NO.

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सहमत विभाग

REV 06

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CLAUSE NO. 13

V Srivastava

V K Chauhan

U. K. Panda

P. K. Bansal

CHANGES WIR.T. REV. 05: REFER

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नाम

NAME

ASHOK RAWAT

ASHISH RANJAN

PLANT STANDARDS COMMITTEE

मानक विभाग

ISSUED: STANDARDS DIVISION

संस्थान मानक समिति

जारी

GOPAL KRISHNAN

हस्ताक्षर एवं दिनॉक

SIGNATURE & DATE

Gr. No

2.60

DATE:30.03.1992

दिनॉक

HW 10786 संस्थान क्रय विनिर्देश (हीप - हरिद्वार) हस्ताक्षर एवं दिनॉक बीएम ईएम SIGN & DATE पृष्ठ Page 2 PLANT PURCHASE SPECIFICATION (HEEP - HARIDWAR) SUPERSEDES INVENTORY NO Manufacturing plan shall be prepared and submitted after successful process qualification. Manufacturing plan shall include specific information on manufacturing like rolling temperature, reduction ratio, heat treatment temperature, hardening method and soaking time, rate of heating संख्या को and cooling etc. Test instructions for nondestructive and destructive testing are to be provided in the manufacturing and testing plan. स्वी Product and process qualification is mandatory for supplier's each manufacturing plants. सामग्री · For new supplier, process qualification shall be required for three purchase orders. · If necessary, BHEL may ask for process qualification for verification of manufacturing reliability from imited regular suppliers also. · Any change in the agreed manufacturing plan shall be informed to BHEL. BHEL will review the COPYRIGHT AND CONFIDENTIAL formation on this document is the property of Blanca Heavy Electrical be used directly or indirectly in any way definential to the interest of requirement of renewed process qualification. 7.0 Heat Treatment: Hardening has to be done in accordance with EN 10088 - 3, + QT 800 in line with Table A.2 (950 - 1050°C /air or liquid quenching). Tempering must be done at a temperature ≥ 650°C. A fully transformed and tempered martensitic microstructure must be present over the entire cross Hardening and tempering in bundles are not allowed. Suitable gaps between two bars are to be ensured during heat treatment for uniformity of properties. The informat If bars need to be straightened after the heat treatment, a stress relieving heat treatment shall be not performed after completion of entire straightening process. Stress relieving is to be carried out at 20 30°C below the tempering temperature with a subsequent slow cooling. भारत हेवी इसेक्ट्रीक्त्म की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष , जो कि कम्पनी के हित में हानिकारक हो ना किया जाए The lowest possible residual stresses shall be targeted. Distortion of the finish machined part due to residual stresses from the manufacturing process or heat treatment process shall not occur. 8.0 Properties and their verification: स्वत्वाधिकार एवं गोपनीय 8.1 Chemical Composition: Heat analysis in weight % Cobalt content must be specified in the inspection certificate for information purposes. स्पना न प्रलेख में दी गई सू गसे किसी भी तरह प 8.2 Properties and Microstructure: The specimens shall be taken in the longitudinal direction in accordance with Attachment 1. The

Si	Mn	P	S	Cr	Ni
0.10 - 0.60	0.30 - 0.80	≤ 0.030	≤ 0.020	12.5 - 14.0	0.30 - 0.80
	Si 0.10 - 0.60				

of

properties described below shall be determined at room temperature in the delivery condition, i. e. after the last heat treatment including any stress relieving heat treatment.

The metallographic investigations shall be performed on the hardest and softest bar with an area of at least 320mm² each. The areas to be investigated must be in the longitudinal direction. The longitudinal direction must be indicated in the documentation.

REV 06	निर्माणकर्ता WORKED BY	Ashish Ranjan	Alayan	26.10.15
मामवी सुवी INVENTOR	जांचकर्ता CHECKED BY	Gopal Krishnan	pllen	26.10.15

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संस्थान क्रय विनिर्देश (हीप - हरिद्वार)

PLANT PURCHASE SPECIFICATION (HEEP - HARIDWAR)

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8.2.1 Mechanical Properties:

Hardness of the bars in a test unit shall be verified by Brinell hardness testing in accordance with ISO 6506 -1, HBW10/3000 or HBW 5/750 may be used.

The surface of the bar shall be prepared in the area of the hardness measurement so that the result is not affected by the surface condition.

Hardness testing shall be performed on 10% of each test unit but at least on 10 bars or on each bar if test unit is less than 10 bars. The greatest resulting difference in hardness shall not exceed 35HBW.

Mechanical properties shall be determined on the hardest and softest bar determined in a test unit.

Tensile testing shall be performed in accordance with ISO 6892 -1 or ASTM E8M (round specimen with L₀ = 50mm and d_0 = 10mm) or ASTM E8 (standard specimen in accordance with Figure 8).

Standard specimens Charpy (V-notch) in accordance with ISO 148 -1 shall be used for determining the absorbed impact energy.

The following properties must be achieved at room temperature:

0.2 % Proof Stress (N/mm²)	Tensile Strength (N/mm²)	Elongation After Fracture (%)	Reduction in area %	Impact Energy (J) ¹	Hardness HBW
≥ 600	800 - 950	≥ 15	≥ 50	≥ 20	240 - 280

¹ Average of 3 specimens and minimum value for two specimens in accordance with EN10021, where the lowest value shall be at least 14 Joule.

8.2.2 Microstructure:

Microstructure must be uniform, without porosity, excessive segregation or other inhomogeneities.

8.2.2.1 Cleanliness:

The cleanliness shall be determined as per ASTM E45 method A. Acceptance criteria:

Inclusion: Thin Series

Type A, B, C: 2 max Type D: 2.5max

Inclusions: Heavy Series

Type A, B, C, D: 1.5max

Maximum Number and dimension of globular inclusions (type D)

IR (D) = n1 + 2.5n2, IR (D) is converted to an area of 160mm^2

 $IR(D) \leq 10$

n = number of globular inclusions

n1 (25-50µm); n2(51-75µm)

Any material discontinuities present at the inclusion must also be accounted for in determining the size of globular inclusion.

Inclusions > 75 μm, including any material discontinuities, are not allowed.

8.2.2.2 Delta Ferrite content and grain size:

- Delta ferrite content shall be < 5%. The determination of delta ferrite content shall be performed based on analysis methods in accordance with ASTM E45 Method A, "Worst field method" with V=100:1.

REV 06	निर्माणकर्ता WORKED BY	Ashish Ranjan	ARayois	26.10.15
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संस्थान क्रय विनिर्देश (हीप - हरिद्वार)

HW 10786 Page of 8

SUPERSEDES INVENTORY NO

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हेवी इलेक्ट्रीकरम की सम्पत्ति है इसका प्रत्यक्ष एवं अपत्यक्ष कि कम्पनी के हित में हानिकारक हो ना किया आए स्वत्वाधिकार एवं गोपनीय स्चमा प्रलेख में दी गई स से किसी भी तरह 井衛井

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PLANT PURCHASE SPECIFICATION (HEEP - HARIDWAR)

An average grain size of 4 or finer has to be achieved. Grain size shall be determined on the martensitic secondary grain structure in accordance with ASTM E112 or ISO643. A deviation of more than 2 grain sizes in size of individual's grains from the average grain size is not allowable.

8.3 Non-destructive Testing:

8.3.1 Test Scope:

The following Non – destructive inspections shall be performed in the as delivered condition:

- Visual inspections of all bars
- Ultrasonic examination of all bars in accordance with TWP 1204. 100% of the volume must be tested in accordance with the recording level.

8.3.2 Recording level and acceptance criteria:

- Indications of surface defects such as rolled marks shall be ground out to investigate their depth at least at both ends, in the middle of the indication and at an interval of approx. 250mm.
- Surface defects with a depth extension of ≥ 1mm are not allowable, and these areas shall be cut out of the bar.
- Ultrasonic examination shall be carried out on all bars in accordance with TWP 1204.
- Defects above the recording level are not acceptable and must be cut out.
- It shall be confirmed in writing to the BHEL that bar sections containing defects above the recording level have been cut out of the bar.
- The acceptance of material at vendor's works does not relieve the supplier of his responsibility for defects discovered at later stages.

8.3.3 Material Identity Test:

An identity test must be conducted in the as - delivered condition on all bars.

9.0 Process Qualification:

In addition to testing as per clause 8.0 of this specification, following additional testing shall be performed in process qualification (see Attachment 2). All test results carried out during process qualification shall be submitted to BHEL for approval.

Tensile tests¹:

The strength values (0.2% Proof Stress and Tensile Strength) in the transverse direction (specimen orientation ZQ) shall not differ by more than 10% from the corresponding longitudinal values.

- The absorbed impact energy in the transverse direction (KQ 1-3) should not differ by more than 25% from the values in the longitudinal direction (KI at room temperature).
- FATT: Determination of FATT (fracture appearance transition temperature) in accordance with ASTM A370. The FATT should be evaluated based on SEP 1670 (software). The test scope must include at least 10 specimens. FATT < 30°C is to be achieved.

In accordance with ISO 6892 -2, a tensile test (in longitudinal direction) has to be performed at 500°C. The following properties must be achieved:

0.2 % Proof Stress (N/mm²)	Tensile Strength (N/mm²)	Elongation After Fracture (%)	Reduction in area (%)
≥ 380	≥ 480	≥ 20	≥ 60

1 For case where standard specimens in transverse direction cannot be made:-

For tensile test specimens, a round specimen with L₀ = 5 d₀ or a flat specimen with a proportionality factor of k= 5.65. Proportional specimens in accordance with Fig 8 shall be used if ASTM E8 is applied.

P. 2187	निर्माणकर्ता WORKED BY	Ashish Ranjan	ARajan	26.10.15
d'	जांचकर्ता CHECKED BY	Gopal Krishnan	pellha	26.10.15

HW 10786 संस्थान क्रय विनिर्देश (हीप - हरिद्वार) Redie बी एम ई एम SIGN & DATE पुष्ठ का (d हस्ताक्षर Page 5 of 8 PLANT PURCHASE SPECIFICATION (HEEP - HARIDWAR) An undersized specimen in accordance with ISO 148 -1 for impact test specimen. Undersize SUPERSEDES dimension to be reported. INVENTORY If dimension do not allow testing in the transverse direction, even with special specimen, testing will be carried out in the longitudinal direction only. **Intergranular Fracture Determination Test:** 怎 The fraction of Intergranular fracture shall be determined over the entire brittle fracture portion of the सख्या fracture surface of the impact test specimens tested at room temperature. The fraction of Intergranular स्वी fracture shall not exceed 10%. This test is not required for materials which indicate ≥90% ductile fracture ामधी at room temperature. **Magnetic Particle Test:** Performance of MT testing by the magnetic flux leakage method, alternating current phase shifted and a field strength of 20 - 65A/cm. is document is the property of Bharat Heavy Electrical Lim or indirectly in any way detrimental to the interest of the Distribution, type and size of grain structure in-homogeneities (e.g. segregation or delta ferrite) shall not COPYRIGHT AND CONFIDENTIAL result in MT indications. 10.0 Identification Marking: All bars are to be marked with following information: Purchase Order Number - Size Material Grade - Supplier Identification The details are to be clearly stamped and encircled by oil paint. Each bar shall be painted with pink mation on this dused directly or colour with white strip on both ends. All the bars shall be suitably packed to protect them against corrosion and damage during transportation. Bars having maximum and minimum hardness (from which test samples are taken) shall be clearly 9 marked by oil paint for easy identification. Their respective hardness values shall also be punched on He these bars. अप्रत्यक्ष 11.0 Documentation: SIR PA Prior to, but in no case later than the delivery of the material, an inspection certificate as per EN 10204 गरत हेवी इलेक्ट्रीकल्स की सम्पत्ति है इसका प्रत्यक्ष ओ कि कम्पनी के हित में ब्रांतिकारक हो ना किया shall be provided to BHEL in duplicate; this certificate must contain the following data: (a) Material code no and P.O. number (b) Material designation प्रव (c) Heat no., heat analysis and melting methods (d) Complete information on all heat treatments performed (d) Mechanical test results including hardness range and the metallurgical examination. (e) Results of non-destructive tests, UT inspection report MILE प्रयोग (f) Confirmation of the material identity check स्यम र प्रलेख में दी गई स् र से किसी भी तरह (g) Dimensions and visual inspection reports 12.0 Cross Referred Standard: ISO 6892-1, EN10088-3, EN10021, ASTM E8M, ISO148-1, EN10021, ASTM E45, TWP1204, ASTME8, ASTM E112, ISO643, ASTM A370, EN10204 Reits 13.0 Modification with respect to last revision: हस्ताक्षर एव Clause 4 modified. 1 Clause 7 modified. REV 06 Ashish 26.10.15 निर्माणकर्ता N संख्या WORKED BY Ranjan 210 संब 26.10.15 जांचकर्ता Gopal सामग्री CHECKED BY Krishnan

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HW 10786 संस्थान क्रय विनिर्देश (हीप - हरिद्वार) दिनॉक बी एम ई एम SIGN & DATE पृष्ठ हस्ताक्षर एव PLANT PURCHASE SPECIFICATION Page 7 of 8 (HEEP - HARIDWAR) SUPERSEDES INVENTORY NO. Attachment 2, Page 1/2 **Process Qualification** te सूची संख्या Label Specimen Tenal ZI Tensile Specimen Centre information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest. of the company ZI WZ ZA Tensile Specimen Rim COPYRIGHT AND CONFIDENTIAL ZQ Tensile Specimen Transverse -KI 9+10 ·KI 11+12 WZ* Hot Tensile Specimen ₹ B KI 1 - KI 12 Notched Impact Specimen Centre (FATT) Longitudinal direction -KA 2-KI 7+8 KI 5+6 KA 1 - KA 3 Notched Impact Specimen Rim KQ 1 - KQ 3 Notched Impact Specimen Transverse KA 3-KI 3+4-* if required in material specification 1+2 The $\overline{\mathbf{x}}$ इस फोख में दी गई सुचना आरत होंगी इनोक्टीनरून की सम्पतित है इसका प्रत्यक्ष एवं अप्रत्यक्ष ब्र्स्टिस किसी मी तरह प्रयोग , ओ कि नम्पनी के हित में हानिकारक हो ना किया आए Note the notch positions of the notch impact specimens (see B - B and C - C). # KQ1-स्वत्वाधिकार एवं गोपनीय ; B-B KQ2-HKQ3-ZQ. C-C A - AKQ1 ZA WZ 1/2 h KQ3 हस्ताक्षर एवं दिनॉक 1/2 b REV 06 2102 निर्माणकर्ता Ashish 26.10.15 गमग्री सूची संख्या INVENTORY WORKED BY Ranjan

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गढ़ सुनम अरत होते इत्रमंत्र में सम्पत्त हैं इत्रमंत्र प्रत्यक्ष प्राप्त प्रतिकार का ता	Upper Surface of the Meta has to be examined. Longit		Lower Surface of the specin Magnetic Particle Test	nen has to be examined in

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HW 10687 संस्थान क्रय विनिर्देश (हीप - हरिद्वार) Alvu fum दिनांक SIGN & DATE पुष्ठ का स्ताक्षर एव Page 1 of 8 PLANT PURCHASE SPECIFICATION (HEEP - HARIDWAR) SUPERSEDES INVENTORY NO. HEAT RESISTANT STEEL BARS FOR TURBINE BLADES Dec. GRADE: X22CrMoV121 +QT2 9248/06. 1.0 General: TE सची संख्या This specification governs the quality of Steel rectangular bars in steel grade X22CrMoV121, material no. 1.4923 EN10269. TLV 2.0 Application: For machining of blades for Steam Turbine. 3.0 Condition of Delivery: of the Rolled or Forged and Heat Treated. tion on these documents is the property of Bharat Heavy Electrical 18 used directly or indirectly in any way detrimental to the interest 4.0 Dimension and Tolerances: COPYRIGHT AND CONFIDENTIAL The dimensions shall be as per purchase order. Unless otherwise stated in the purchase order, length of bars shall be 3 - 6 meters with maximum 10% short down to 1 meter. Tolerance and straightness of bars shall be as follows: not be B, width across flats Max Allowable deviation S, thickness Max Allowable deviation on S, mm (mm) on B, mm (mm) The B ≤ 35 + 1.5 S ≤ 20 +1 + 2 +2 35< B ≤ 75 $20 < S \le 40$ आद D) + 3 +3 B > 75S > 40हेवी इतेन्द्रीक्त्म की सम्पत्ति है इसका प्रत्यक्ष कि कम्पनी के हित से हानिकारक हो ना किया Twisting and bending of the bars shall not exceed 0.001X Length of bar limited to maximum 2mm in एवं गोपनीय any one meter length of the bar. Bulging on the sides shall not be more than 0.01 X B and 0.02 X S respectively. स्वत्वाधिकार 5.0 Manufacture: Degassed steel (e.g. vacuum degassed) shall be used. Cast ingot is to be used as initial material for production of the bars. भारत 传 The manufacturing process must ensure a homogenous grain structure over the entire length of the द्योग स्यम bar and the bar cross section. FRE 管 女 6.0 General Requirements: प्रलेख में दी म किसी Prerequisite requirement for approval of a new vendor is a successful Process qualification. Manufacturing process established during this shall be the basis for future manufacture. TSX V Srivastava नाम हस्ताक्षर एवं दिनॉक हस्ताक्षर एवं दिनॉक NAME SIGNATURE & DATE **PSC** V K Chauhan QAX U. K. Panda अनवादक TRANSLATED BY ASHOK RAWAT STE P. K. Bansal र्माणकर्ता WORKED BY ASHISH RANJAN जांचकर्ता CHECKED BY

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APPROVED

PREPARED: MTE

T S GOPAL KRISHNAN

मानक विभाग ISSUED: STANDARDS DIVISION

PLANT STANDARDS COMMITTEE

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HW 10687 संस्थान क्रय विनिर्देश (हीप - हरिद्वार) वीएम ई एम पुष्ठ M Page 2 PLANT PURCHASE SPECIFICATION (HEEP - HARIDWAR) SUPERSEDES INVENTORY NO. Manufacturing plan shall be prepared and submitted after successful process qualification. Manufacturing plan shall include specific information on manufacturing like rolling temperature, reduction ratio, heat treatment temperature, hardening method and soaking time, rate of heating 乍 and cooling etc. Test instructions for nondestructive and destructive testing are to be provided in the सूची संख्या manufacturing and testing plan. Product and process qualification is mandatory for each of the supplier's manufacturing plants. Haff For new supplier, process qualification shall be required for three purchase orders. mation on this document is the property of Bharat Heavy Electrical Limited. It must used directly or indirectly in any way detrimental to the interest. of the company · If necessary, BHEL may ask for process qualification for verification of manufacturing reliability from regular suppliers also. · Any change in the agreed manufacturing plan shall be informed to BHEL. BHEL will review the COPYRIGHT AND CONFIDENTIAL requirement of renewed process qualification. 7.0 Heat Treatment: Hardening has to be done in accordance with EN 10269 + QT2 in line with Table B .1 (1020 - 1070°C /air or liquid quenching). Tempering must be done at a temperature ≥ 650°C. A fully transformed and tempered martensitic microstructure must be present over the entire cross Hardening and tempering in bundles are not allowed. Suitable gaps between two bars are to be ensured during heat treatment for uniformity of properties. The informat If bars need to be straightened after the heat treatment, a stress relieving heat treatment shall be performed after completion of entire straightening process. Stress relieving is to be carried out at 20 30°C below the tempering temperature with a subsequent slow cooling. भारत हैवी इतेक्ट्रीकरम की सम्पत्ति है इसका प्रत्यक्ष एव अप्रत्यक्ष , जो कि कम्पनी के हित में हानिकारक हो ना किया जाए The lowest possible residual stresses shall be targeted. Distortion of the finish machined part due to residual stresses from the manufacturing process or heat treatment process shall not occur. 8.0 Properties and their verification: स्वत्वाधिकार एवं गोपनीय 8.1 Chemical Composition: Heat analysis in weight % प्रयोग स्यमा इस प्रतेख में दी गई स् रूप से किसी भी तरह S

С	Si	Mn	P	S	Cr	Мо
0.18 - 0.24	0.10 - 0.50	0.30 - 0.80	≤ 0.020	≤ 0.020	11.0 - 12.5	0.80 - 1.20

of

Ni	V		
0.30 - 0.80	0.25 - 0.35		

8.2 **Properties and Microstructure:**

The specimens shall be taken in the longitudinal direction in accordance with Attachment 1. The properties described below shall be determined at room temperature in the delivery condition, i. e. after the last heat treatment including any stress relieving heat treatment.

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संस्थान क्रय विनिर्देश (हीप - हरिद्वार)

PLANT PURCHASE SPECIFICATION

(HEEP - HARIDWAR)

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The metallographic investigations shall be performed on the hardest and softest bar with an area of at least 320mm² each. The areas to be investigated must be in the longitudinal direction. The longitudinal direction must be indicated in the documentation.

8.2.1 Mechanical Properties:

Hardness of the bars in a test unit shall be verified by Brinell hardness testing in accordance with ISO 6506 -1, HBW10/3000 or HBW 5/750 may be used.

The surface of the bar shall be prepared in the area of the hardness measurement so that the result is not affected by the surface condition.

Hardness testing shall be performed on 10% of each test unit but at least on 10 bars or on each bar if test unit is less than 10 bars. The greatest resulting difference in hardness shall not exceed 35HBW.

Mechanical properties shall be determined on the hardest and softest bar determined in a test unit.

Tensile testing shall be performed in accordance with ISO 6892 -1 or ASTM E8M (round specimen with L₀ = 50mm and d_0 = 10mm) or ASTM E8M (standard specimen in accordance with figure 8).

Standard specimens Charpy (V-notch) in accordance with ISO 148 -1 shall be used for determining the absorbed impact energy.

The following properties must be achieved at room temperature:

0.2 % Proof Stress (N/mm²)	Tensile Strength (N/mm²)	Elongation After Fracture (%)	Reduction in area %	Impact Energy (J) ¹	Hardness HBW
≥ 700	900 - 1050	≥11	≥ 35	≥ 20	265 - 310

¹ Average of 3 specimens and minimum value for two specimens in accordance with EN10021, where the lowest value shall be at least 14 Joule.

8.2.2 Microstructure:

Microstructure must be uniform, without porosity, excessive segregation or other inhomogeneities.

8.2.2.1 Cleanliness:

The cleanliness shall be determined as per ASTM E45 method A. Acceptance criteria:

Inclusion: Thin Series

Type A, B, C: 2 max Type D: 2.5max

Inclusions: Heavy Series

Type A, B, C, D: 1.5max

Maximum Number and dimension of globular inclusions (type D)

IR (D) = n1 + 2.5n2, IR (D) is converted to an area of 160mm^2

 $IR(D) \leq 10$

n = number of globular inclusions

n1 (25-50 μm); n2 (51-75 μm)

Any material discontinuities present at the inclusion must also be accounted for in determining the size of the globular inclusion.

Inclusions $> 75 \mu m$, inclusing any material discontinuities are not allowable.

त प्रतेख में दी गई स् प से किसी भी तरह हस्ताक्षर

The

मारत हेवी इतेक्ट्रीकच्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष . जो कि कम्पनी के हित में हानिकारक हो ना किया जाए

स्चना प्योग

स्वत्वाधिकार एवं गोपनीय

NVENTORY NO संख्या 2006 स्वी सामग्री

REV 06

WORKED BY जांचकर्ता

निर्माणकर्ता

Ashish Ranjan 26.10.15

CHECKED BY

Gopal Krishnan

ASTM E8 is applied.

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proportionality factor of k= 5.65. Proportional specimens in accordance with Fig 8 shall be used if

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जांचकर्ता

WORKED BY

CHECKED BY

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Ranjan

Gopal

Krishnan

26.10.15

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HW 10687 संस्थान क्रय विनिर्देश (हीप - हरिद्वार) एवं दिनॉक बीएम ईएम SIGN & DATE पुष्ठ का हस्ताक्षर Page of 8 5 PLANT PURCHASE SPECIFICATION (HEEP - HARIDWAR) An undersized specimen in accordance with ISO 148 -1 for impact test specimen. Undersize SUPERSEDES INVENTORY NO dimension to be reported. If dimension do not allow testing in the transverse direction, even with special specimen, testing will be carried out in the longitudinal direction only. **Intergranular Fracture:** 信 The fraction of Intergranular fracture shall be determined over the entire brittle fracture portion of the संख्या fracture surface of the impact test specimens tested at room temperature. The fraction of Intergranular संची fracture shall not exceed 10%. This test is not required for materials which indicate ≥90% ductile fracture at room temperature. not **Magnetic Particle Test:** COPYRIGHT AND CONFIDENTIAL. this document is the property of Bharat Heavy Electrical Limited. It must city or indirectly in any way detrimental to the interest. of the company city or indirectly in any way detrimental to the interest. Performance of MT testing by the magnetic flux leakage method, alternating current phase shifted and a field strength of 20 - 65A/cm. Distribution, type and size of grain structure in-homogeneities (e.g. segregation or delta ferrite) shall not result in MT indications. 10.0 Identification Marking: All bars are to be marked with following information: - Purchase Order Number - Size Material Grade - Supplier Identification used directly or indirectly The details are to be clearly stamped and encircled by oil paint. Each bar shall be painted with gold colour on both ends. All the bars shall be suitably packed to protect them against corrosion and damage during transportation. Bars having maximum and minimum hardness (from which test samples are taken) shall be clearly 50 marked by oil paint for easy identification. Their respective hardness values shall also be punched on The these bars. एवं अप्रत्यक्ष 11.0 Documentation: SHE Prior to, but in no case later than the delivery of the material, an inspection certificate as per EN 10204 गरत हेवी इतेक्ट्रीकरम की सम्पत्ति है इसका प्रत्यक्ष ओ कि कम्पनी के हित में हानिकारक हो ना किया shall be provided to BHEL in duplicate; this certificate must contain the following data: स्वत्वाधिकार एवं गोपनीय (a) Material code no and P.O. number (b) Material designation (c) Heat no., heat analysis and melting methods (d) Complete information on all heat treatments performed (d) Mechanical test results including hardness range and the metallurgical examination. (e) Results of non-destructive tests, UT inspection report भारत प्योग (f) Confirmation of the material identity check प्रलेख में दी गई सूचना से किसी भी तरह प्रयोग (g) Confirmation of the dimensions and visual inspection हम से किसी 12.0 Cross Referred Standard: ISO 6892-1, EN10088-3, EN10021, ASTM E8M, ISO148-1, EN10021, ASTM E45, TWP1204, ASTME8, ASTM E112, ISO643, ASTM A370, EN10204 31/1/1 13.0 Modification with respect to last revision: हस्ताक्षर एवं दिनोंक Clause 4 modified. Clause 7 modified. REV 05 Ashish निर्माणकर्ता jan 26.10.15 300 सूची संख्या WORKED BY Ranjan

जांचकर्ता

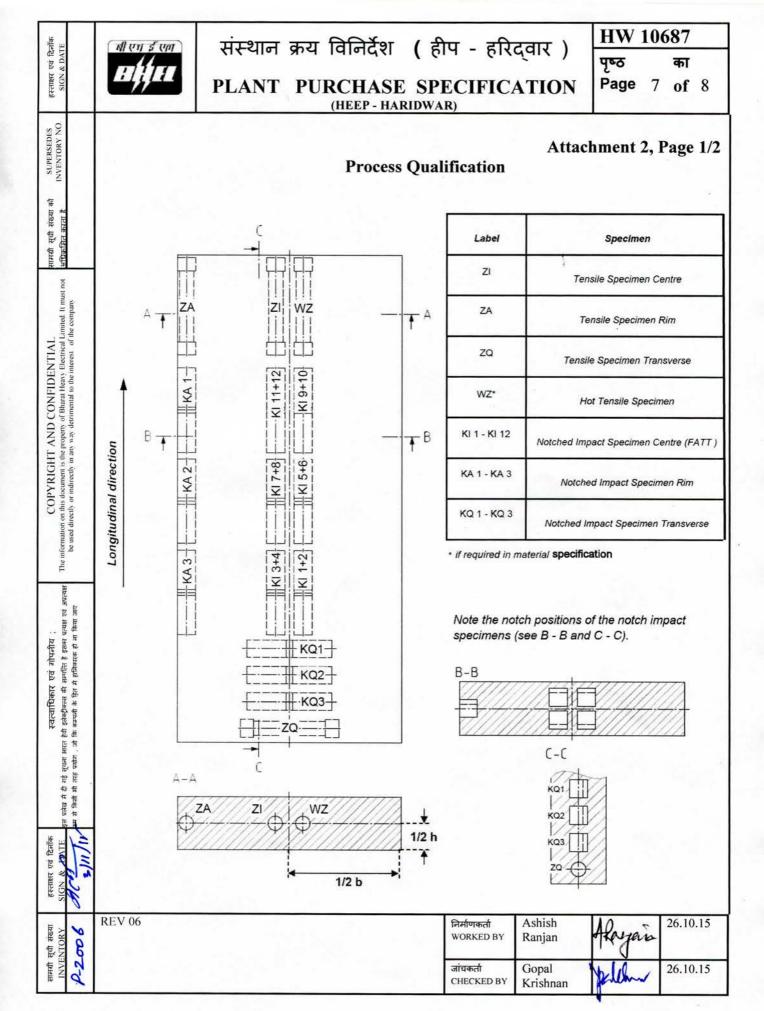
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